MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

17 OCTOBER 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with **FIVE** questions.

2. Attempt **ALL** five questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.

4. **No calculators are allowed**.

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You are required to write proper steps.

Question 1 [10 marks]

a) Simplify the expression and write your final expression as a single fraction.

$$\frac{2y-6}{y^2-9} \div \frac{y-3}{y+3}$$ (2 marks)

b) Rationalize the denominator for $\frac{1+\sqrt{5}}{3+2\sqrt{5}}$ and simplify. (2 marks)

c) Expand the following expression.

$$(a+2b)^3$$ (2 marks)

d) Simplify the following expression and give your final expression as a single term.

$$x\sqrt{50y^2} + \sqrt{200x^2y^2}$$ (2 marks)

e) Express the following in the form $a+bi$, where a and b are real numbers.

$$\frac{3}{2-i} + \frac{1}{2+i}$$ (2 marks)

Continued ...

Question 2 [10 marks]

a) Solve the equation $2x^2 - 3x + 4 = 0$ by using quadratic formula.
Leave your answer in the form $a + bi$, where a and b are real numbers.

(2 marks)

b) Solve the inequality $\frac{x-1}{(x-2)(x+3)} > 0$.

Show clearly your Sign Diagram and give your final answer in interval notation.

(3 marks)

c) Solve the inequality $\left|\frac{1}{2}x - 6\right| < 4$. Give your final answer in interval notation.

(2 marks)

d) Solve the equation $\sqrt{x-2} = 8 - x$. Remember to check your answers.

(3 marks)

Continued ...

Question 3 [10 marks]

a) Given a function $f(x)=\dfrac{4x+k}{2x-3}$, where k is a constant.

i) Find the domain of f. Leave your answer in interval notation.

ii) If $f(5)=5$, show that value of k is 15.

iii) Find $f^{-1}(x)$.

(5 marks)

b) Given a polynomial function $f(x)=2(x+1)^2(x-1)(x-3)$.

i) What is the degree of f?

ii) Find the zeros of f and their multiplicities.
At each zero, determine whether the graph of f crosses or touches the x-axis .

iii) Find the y-intercept of the graph of f.

iv) Determine the end behavior of f.

v) Sketch the graph of the function f.
Make sure your graph shows all intercepts and exhibits the proper end behaviour.

(5 marks)

Continued ...

Question 4 [10 marks]

a) Use long division to find the quotient and the remainder when the polynomial $P(x) = -2x^3 - 11x - 12x + 9$ is divided by $(x+3)$.

You are required to state clearly what the quotient and remainder are.

(3 marks)

b) Use remainder theorem to find the remainder when the function $f(x) = x^3 - 2x + 4$ is divided by $(x-1)$.

(1 mark)

c) Combine the following expression into a single logarithm.

$$\frac{1}{2}\log_{10} 25 - 2\log_{10} 3 + 2\log_{10} 6$$ (2 marks)

d) Solve the following equation : $2^{2x} = 5$.
Express your answer in terms of logarithms to base 10. (2 marks)

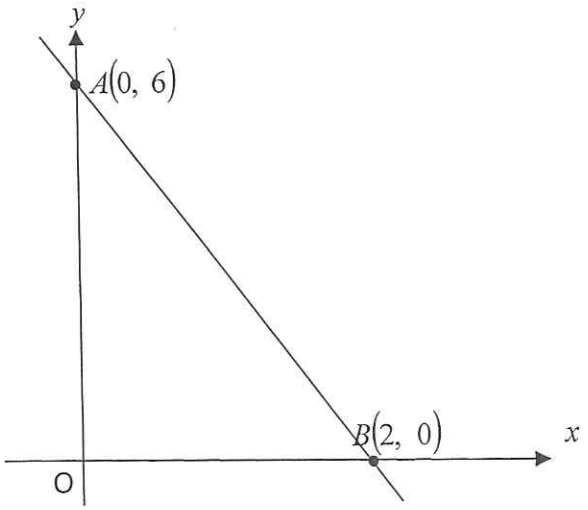
e) The graph of an exponential function $f(x) = 3^{-2x+k}$ passes through the point $\left(\frac{1}{2}, 3\right)$. Find the value of k.

(2 marks)

Continued ...

Question 5 [10 marks]

a) The diagram below shows a straight line passing through the points $A(0,\ 6)$ and $B(2,\ 0)$. M is the midpoint of AB.



Find :

i) the coordinates of M,

ii) the slope of the line AB,

iii) the slope of a straight line perpendicular to the line AB,

iv) an equation of a straight line which is perpendicular to the line AB and passes through the point M.

(4 marks)

b) A point $P(x,\ y)$ moves such that its distance is always 4 units from $Q(-2,\ 5)$. Find an equation of the locus of P. Express your final answer in the form $x^2 + y^2 + bx + cy + d = 0$ where b, c and d are real numbers.

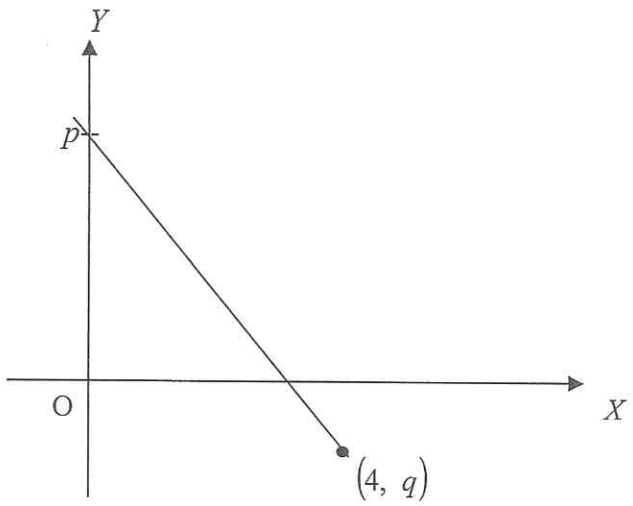
(3 marks)

Continued ...

c) Two variables x and y are related by an equation $y\sqrt{x} = \frac{5}{\sqrt{x}} - 2$.

i) Let $Y = xy$ and $X = \sqrt{x}$, transform the equation $y\sqrt{x} = \frac{5}{\sqrt{x}} - 2$ in terms of X and Y.

ii) Figure below shows a straight line obtained by plotting Y against X in i), find the values of p and q.



(3 marks)

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